

REMARKS

Claims 1-5, 7, 9, 11, 13-14, 16, 18, and 20-33 are pending in the present application.

In the Office Action, claims 1-5, 7, 9, 11, 13-14, 20-29 and 32-33 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Haughland (U.S. Patent No. 4,721,180) in view of Robertson (WO 00/57207). The Examiner's rejections are respectfully traversed.

Independent claims 1, 6, 20, and 24 set forth acquiring seismic data using a seismic source array including at least two seismic sources. At least one of the seismic sources is deployed directly above at least one other seismic source. The seismic source array is configured to provide at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency such that the seismic signals combine to form a seismic wavefield having a frequency spectrum within the seismic bandwidth that does not contain a source ghost at a non-zero frequency. Independent claims 1, 6, 20, and 24 also set forth at least two seismic receivers for acquiring seismic data. At least one of the seismic receivers is deployed directly above at least one other seismic receiver.

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). Haughland describes a seismic source array for suspending seismic sources at different depths below the water surface. However, Haughland does not describe or suggest deploying seismic sensors directly above each other. Haughland also fails to describe or suggest deploying seismic receivers directly above one another. Furthermore, as admitted by the Examiner on page 2 of the Office Action, Haughland fails to teach or suggest processing the acquired seismic data to attenuate the effect of ghost reflections in the seismic data.

Robertsson describes techniques for reducing the effects of sea surface ghost contamination in seismic data. However, Robertsson fails to teach or suggest deploying either seismic sources or seismic receivers at different depths. In particular, Robertsson fails to teach or suggest deploying seismic sources or seismic receivers directly above one another. Thus, Applicants respectfully submit that the cited references fail to teach or suggest all the limitations of the invention set forth in independent claims 1, 6, 20, and 24.

The cited references also fail to provide any suggestion or motivation to modify the prior art of record to arrive at Applicants claimed invention. To the contrary, the cited references are completely silent with regard to the problems associated with removing ghost signals from seismic data acquired using seismic sources and/or seismic receivers that are not deployed directly above one another. For example, an uneven sea surface may result in the water level above the different sources and/or receivers being different, which is known in the art to greatly degrade the effect of deghosting at least in part because the ghost effects depend greatly on the distance between the source and/or receiver and the sea surface. Thus the cited references fail to provide any suggestion or motivation for deploying the seismic sources and/or receivers directly above one another.

For at least the aforementioned reasons, Applicants respectfully submit that the present invention is not obvious over the cited references. Applicants request that the Examiner's rejections of claims 1-5, 7, 9, 11, 13-14, 20-29 and 32-33 under 35 U.S.C. 103(a) be withdrawn.

In the Office Action, claims 1-5, 7, 9, 11, 13-14, 20-29 and 32-33 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ray (U.S. Patent No. 4,493,061) in view of Robertson. Claims 16, 18, and 30-31 were rejected under 35 U.S.C. § 103(a) as allegedly being

unpatentable over Ray in view of Robertson and further in view of Lee (U.S. Patent No. 6,606,278). The Examiner's rejections are respectfully traversed.

Ray describes stacked marine seismic sources including a plurality of sources S1, S2, S3 suspended at different depths below the water surface. However, Ray fails to describe or suggest deploying seismic receivers directly above one another, as set forth in independent claims 1, 6, 20, and 24. Furthermore, as admitted by the Examiner on page 9 of the Office Action, Ray fails to teach or suggest processing the acquired seismic data to attenuate the effect of ghost reflections in the seismic data.

As discussed above, Robertsson describes techniques for reducing the effects of sea surface ghost contamination in seismic data. However, Robertsson fails to teach or suggest deploying seismic receivers at different depths. In particular, Robertsson fails to teach or suggest deploying seismic receivers directly above one another. Thus, Applicants respectfully submit that the cited references fail to teach or suggest all the limitations of the invention set forth in independent claims 1, 6, 20, and 24.

The cited references also fail to provide any suggestion or motivation to modify the prior art of record to arrive at Applicants claimed invention. To the contrary, the cited references are completely silent with regard to the problems associated with removing ghost signals from seismic data acquired using seismic sources and/or seismic receivers that are not deployed directly above one another. In particular, an uneven sea surface may result in the water level above the different sources and/or receivers being different, which is known in the art to greatly degrade the effect of deghosting at least in part because the ghost effects depend greatly on the distance between the source and/or receiver and the sea surface. Thus the cited references fail to

provide any suggestion or motivation for deploying the seismic sources and/or receivers directly above one another.

In rejecting dependent claims 16, 18, and 30-31, the Examiner relies upon Lee to describe a bubble diffuser that provides high acoustic reflection off of the air bubbles. However, Lee fails to correct the deficiencies of the primary references discussed above.

For at least the aforementioned reasons, Applicants respectfully submit that present invention is not obvious over the cited references. Applicants request that the Examiner's rejections of claims 1-5, 7, 9, 11, 13-14, 16, 18, and 20-33 under 35 U.S.C. 103(a) be withdrawn.

For the aforementioned reasons, it is respectfully submitted that all claims pending in the present application are in condition for allowance. The Examiner is invited to contact Mark W. Sincell at (713) 934-4052 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,

Date: June 30, 2006

// Mark W. Sincell //
Mark W. Sincell, Ph.D.
Reg. No. 52,226
Williams Morgan & Amerson, P.C.
10333 Richmond Avenue, Suite 1100
Houston, TX 77042
(713) 934-7000
(713) 934-7011 (Fax)

AGENT FOR APPLICANTS